CLIMATE NARRATIVE, April 2020 and as noted

Climate_Narratives may be found, https://coastwatch.pfeg.noaa.gov/elnino/coastal_conditions.html
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UNITED STATES WEST COAST AND NORTH PACIFIC

During late April 2020, satellite **derived sea surface temperatures** (SST_A) for US west coast, from 20 to 250 km offshore, showed positive SST_A anomaly ($\leq 2°C$) persisting off central and southern California and northern Mexico (30°-38°N), where SST_A was between 11°-21°C. The negative SST_A anomaly ($\geq -1.5°C$) in areas off Oregon weakened, but persisted 250 km offshore and northwest alongshore into the eastern Gulf of Alaska. West of coastal waters, an area of negative SST_A anomaly extended westward off Mexico and California (20°-40°N) to 140°W. Areas of strong positive anomaly ($\leq 2.5°C$) were seen between 25°-58°N and 130°-165°W. This anomalously warm area had a northwestward extension through the Aleutian Island chain into the Bearing Sea and another extension centered near 30°N reached westward to 150°E. The western boundary of the north Pacific Ocean was average to below average temperature with a tongue of this negative to neutral anomaly reaching eastward beyond the date line (180°E/W) between 40°-50°N. Weak positive SST anomaly ($\leq 1.0°C$) persisted across most of the tropical Pacific between 5°S-20°N, but areas of negative anomaly expanded east of 110°W. Areal positions and SST anomaly magnitudes may vary depending on source and compositing and processing assumptions.

https://www.ospo.noaa.gov/Products/ocean/sst/anomaly/
https://coastwatch.pfeg.noaa.gov/elnino/coastal_conditions.html (current)
https://coastwatch.pfeg.noaa.gov https://climatereanalyzer.org/wx/DailySummary/#sstanom (current)
https://www.ospo.noaa.gov/Products/ocean/sst/contour/index.html

April **Sea Level Height Anomaly** (SLA) analyses of the Pacific Ocean from the equator (0°N/S) to 40°N, show predominately negative SLA (≤ 15 cm) across the Pacific Ocean between the equator and 20°N and along the eastern and western boundaries, extending northward beyond 40°N. Positive SLA occurred off Central American and southern Mexico extending west to 110°W. East of 180° E/W and north of 20°N areas of weak positive and negative SLA were about equal. North of 20°N a large area ($> 5x10^6$ km^2) of positive anomaly occurred west of 180° E/W.

http://www.cpc.ncep.noaa.gov/products/analysis_monitoring/ocean/weeklyenso_clim_81-10/wksl_anm.gif (current)

April satellite imagery of US west coast **chlorophyll-a** (chl-a) showed an increase in surface concentrations within 50-100 km of shore. Between the southern California and Vancouver Island (34°-50°N) surface chl-a of 0.5- 5.0 mg/m^3 extended from the coast 200-700 km offshore. This coastal zone of high chl-a was most strongly developed between 33°N and 40°N. Chl-a concentrations 5-10 mg/m^3 occurred inshore locally. Extremely high chl-a concentrations (>1000 mg/m^3) were found in "red tide" off San Diego county and northern Mexico (see Notes). Offshore water (≤ 0.2 mg/m^3) entered the Southern California Bight from the south and southwest. Derived surface layer chl-a concentrations and distributions may vary depending on satellite sensors and compositing techniques.

https://coastwatch.pfeg.noaa.gov/coastwatch/CWBrowserWW180.jsp#
https://coastwatch.pfeg.noaa.gov/erddap/griddap/erdVHNchla8day.graph?chla[(2020-04-30T00:00:00Z)][(0.0)][(83.65125):(-0.10875)][(-193.76625):(-110.00625)]&.draw=surface&.vars=longitude%7Clatitude%7Cchla&.colorBar=%7C%7C%7C%7C%7C&.bgColor=0xffccccff
https://www.star.nesdis.noaa.gov/sod/mecb/color/ (current)

April sea temperature from shore stations and **near-shore buoys,**

The following list gives shore and nearshore water temperature measurement locations in decreasing latitude. Each line begins with a shore station or buoy abbreviation followed by latitude. Within the list, temperature values are in brackets with the average of available monthly values first (followed by the range) in parens and change from previous monthly mean. Averages for the (first, second and ending) third of the month (tercile), are within the second parens, followed by the multiyear monthly average, where available from sources. Subscripts H and L indicate the tercile that contains the Highest and Lowest monthly temperatures.

Seasonal warming trends are clear from the Eel River Buoy (EelR) to Neah Buoy (Neah) by a more than 1°C increase in average temperature from March to April. Each measurement location (except Monterey) from Arena Cove (ArCv) to the Santa Barbara Channel (SBCh) had decreases in average temperature from March. From Santa Monica (SMca) to Point Loma the seasonal increase in temperature was less than 1°C.

List (April 2020)

Neah,48.5°N,124.7°W [9.3(8.3-11.7)1.1(8.9$_L$,9.2,9.9$_H$)9.4°C]

Cape Flattery 48.4°N

NeBy,48.4°N [9.6(8.4-11.7)1.6(9.0$_L$,9.8$_H$,10.1$_H$)°C]

CpEz,47.4°N,124.7°W [10.0(8.7-11.5)1.2(9.3$_L$,10.1$_H$,10.7$_H$)10.3]

TlMk,46°N,125.8°W [10.4(9.1-12.5)1.1(9.5 $_L$,10.6 $_H$,11.2 $_H$)10.4°C]

Cape Blanco 42.8°N

PrtO,42.7°N [10.5(8.2-12.9)1.4(10.4,9.4$_L$,11.7$_H$)°C]

CCty,41.7°N [11.6(10.2-13.3)1.8(11.3,11.3$_L$,12.0$_H$)°C]

EelR,40.7°N,124.5°W [11.7(10.6-13.8)1.6(10.9$_L$,11.3,12.3$_H$)11.1°C]

Point Arena 39°N

ArCv,38.9°N [10.7(9.2-13.3)-0.5(10.6,11.3$_H$,10.2$_{LH}$)°C]

Point Reyes 38°N

SFrn,37.8°N,122.8°W [11.9(10.6-14.1)-0.4(11.6,12.5$_H$,11.6 $_{LH}$)11.5°C]

Mtry,36.6°N [15.6(13.9-17.3)1.4(15.1$_L$,15.4,16.3$_H$)°C]

Point Sur, 36.3°N

PrtS,35.1°N [12.9(11.1-14.4)-1.8(12.7$_H$,13.3,12.8$_L$)°C]

PtCn,34.5°N,120.8°W [13.2 (11.3-15.2)-1.5(13.2,14.0$_H$,12.5$_L$)°C]

Point Conception,34.4°N

SBCh,34.3°N,119.9°W [14.4 (12.8-16.8)-0.4(13.9$_L$,14.9,14.5$_H$)12.7°C]

SMca,34°N [16.7(14.9-19.1)0.5(16.3$_L$,16.7,17.2$_{LH}$)°C]

Tory,32.9°N,177.4°W [15.9 (13.8-20.8)0.9(14.6$_L$,15.6,17.5$_H$)°C]

LaJo,32.9°N [16.3 (12.5-19.9)0.1(15.6,16.4,16.8$_{LH}$)°C]

Point Loma, 32.7°N

Shore measurements, taken at a fixed depth below the lowest tide at NOAA **tide stations**, are indicated by: *NeBy* (9443090), *PrtO* (9431647), *CCty* (9419750), *ArCv* (9416841), *Mtry* (9413450), *PrtS* (9412110), *SMca* (9410840), *LaJo* (9410230) in. (Numbers) lead to detailed location and station descriptions, https://tidesandcurrents.noaa.gov/stations.html?type=Physical%20Oceanography

. Near shore NOAA buoy measurement details are obtained from number designations: Neah (46087), CpEz (46041),TlMk (46089), EelR (46022), SFrn (46026), PtCn (46218), SBCh (46053), Try (46225). https://www.ndbc.noaa.gov/station_page.php?station=46087

EQUITORIAL AND SOUTH PACIFIC (late April and as noted)

Weak positive SST_A anomaly (≤1.5°C) persisted across the Equatorial Pacific (EP), except for small expanding areas of negative anomaly east of 110°W. Current El Niño-neutral atmospheric conditions are expected continue into boreal summer. Positive subsurface temperature anomalies (≤2°C) decreased resulting in a decrease in the eastern EP upper 300 m heat content anomaly, that became negative at the beginning of April. A large area of positive SST_A anomaly intensified in the eastern south Pacific between 10°-60°S and 140°-175 °W. This area was flanked on the west by variable negative anomaly that extended to the east and south coasts of Australia. South of 30°S, large areas (≥10^6 km^2) of weakly negative SST_A anomaly occurred east of 140°W extending toward the Antarctic Peninsula (60°S, 60°W). http://www.ospo.noaa.gov/Products/ocean/sst/anomaly/
https://www.cpc.ncep.noaa.gov/products/analysis_monitoring/lanina/enso_evolution-status-fcsts-web.pdf
https://www.ospo.noaa.gov/Products/index.html

Sea level height anomaly (SLA) analyses of the south Pacific Ocean (north of 30°S) showed negative SLA (≥-10 cm) along the South American coast and northward to 10°N. This area (>5 x10^6 km^2) extended westward to 160°E, 150°W and to the Australian Coast at the equator, 10°S and 20°S, respectively. In the central south Pacific, positive SLA (≤15 cm) was found from 120°W to 180°E, extending meridionally from 15°S to 8°S. South of 20°S, additional positive SLA reached from 140°W to 150°E.
http://www.cpc.ncep.noaa.gov/products/analysis_monitoring/ocean/weeklyenso_clim_81-10/wksl_anm.gif (current)

The NOAA **Oceanic El Niño Index** (ONI) (3-month running mean of SST anomalies in the Nino 3.4 region) increased to 0.5 for October-November-December (OND), then remained ≥ 0.5 through FMA, giving five consecutive marginal El Niño positive values. http://www.cpc.ncep.noaa.gov/products/analysis_monitoring/lanina/enso_evolution-status-fcsts-web.pdf
https://climatedataguide.ucar.edu/climate-data/multivariate-enso-index (alternate El Niño index)

The NOAA/NCEI **Pacific Decadal Oscillation Index** (PDO), calculated from Pacific Basin wide ERSST.v4 was -1.40 for January and -1.35 for February. Each of these values lower than any calculated in 2019. March SST_M distributions suggests another negative value for March. For April, SST_A suggests PDO closer to neutral.
https://www.ncdc.noaa.gov/teleconnections/pdo/ , https://www.ospo.noaa.gov/data/sst/anomaly/2020/anomnight.3.30.2020.gif

The Pacific / North American Teleconnection Index (PNA), computed from atmospheric pressure over the Pacific Ocean and North America had persistently negative values in March, but less so in April, with monthly mean PNA values of -2.64 and -0.09, respectively. https://www.cpc.ncep.noaa.gov/data/teledoc/pna.shtml (see computational alternatives).

April monthly ERD/SWFSC west coast Upwelling Indices (UI) were strongly positive from northern Mexico to central California (24°-39°N), with positive UI anomalies. North of 45°N UI was near neutral, not favoring either upwelling or downwelling in the UI means or anomalies.
https://upwell.pfeg.noaa.gov/products/PFELData/upwell/monthly/table.2004
Daily UI were generally positive for 36°N and strongly positive during the first three days and the last ten days of April.
https://oceanwatch.pfeg.noaa.gov/products/PFELData/upwell/daily/p10dayac.all (36°N)
https://oceanwatch.pfeg.noaa.gov/products/PFELData/upwell/daily/p09dayac.all (39°N) (see computational alternatives)
https://oceanview.pfeg.noaa.gov/products/upwelling/dnld (current)

PRECIPITATION and RUNOFF (April)

Coastal Washington precipitation totals were near or above seasonal averages. Southern Oregon and northern California had rain in April but remained in moderate drought, with water year totals between 60% and 70% of normal and precipitation deficits between 15-25 in. https://droughtmonitor.unl.edu.
https://www.cpc.ncep.noaa.gov/products/global_monitoring/precipitation/global_precip_accum.shtml
https://waterdata.usgs.gov/ca/nwis/nwis

Northwest and Washington River Discharge

Fraser River discharge, measured in late April at Hope (130 km upriver from Vancouver, B.C.), was 4,840 m^3/s (170,852 cubic feet /sec or cfs). The late April multi-year median for Hope is 3,200 m^3/s. https://wateroffice.ec.gc.ca The **Queets** at Clearwater, WA was flowing at 3,320 [2,730, -6,180 cfs-historical median and change from previous month as cfs in brackets]. The **Puyallup** at Puyallup was flowing at 3,570 [1,760, 1,870 cfs]. **Skagit** flow was 22,000 [15,700, 8,800 cfs] near Mount Vernon. **Stillaguamish** discharge was 2,700 [1,910, 770 cfs] at Arlington. **Columbia** transport was 268,000 [222,000, 112,000 cfs] at Vancouver, WA.

Oregon River Discharge

The **Columbia** at the Dalles, OR was discharging 207,000 [253,000, 60,000 cfs]. The **Wilson** at Tillamook, was flowing at 449 [657, -2,251 cfs]**.** At Elkton, **Umpqua** transport was 5,700 [6,540, -7,600 cfs]. **Rogue R.** flow was 2,320 [3,820, 20 cfs] at Grants Pass and 2,590 [5,440, -2,390 cfs] at Agness.

California River Discharge

The **Klamath** near Klamath, CA was transporting 12,800 [17,400, -1,900 cfs]. **Smith** R. discharge was 1,080 [2,620, -12,520 cfs] near Crescent City. The **Eel** at Scotia had 1,200 [3,840, -950 cfs] transport. **Battle Creek,** Coleman National Fish Hatchery, flow was 408 [553, -46 cfs]. **Butte Creek** at Chico had 223 [453, 21 cfs] transport. **Sacramento R.** transport was 7,580 [13,500, -4,020 cfs] at Verona and 12,300 [15,900, -2,300 cfs] at Freeport. **San Joaquin** flow was,1,810 [3,610, 380 cfs] at Vernalis. **Pescadero Creek** transport was 8 [16, -3 cfs] near Pescadero. **San Lorenzo R.** discharge was 35 [59, 3 cfs] at Santa Cruz. The **Pajaro** at Chittenden was flowing at 54 [37, -7 cfs]. The **Salinas** near Spreckels was at 92 [5, 18 cfs]. The **Carmel R.** at Carmel was flowing at 93 [54, -14 cfs]. The **Big Sur** near Big Sur, CA discharged at 82 [63, 7 cfs] during the final days of April.
https://waterdata.usgs.gov/ca/nwis/current/?type=flow https://www.cnrfc.noaa.gov/awipsProducts/RNOWRKCLI.php= (current)
https://wateroffice.ec.gc.ca/search/real_time_results_e.html
https://www.cpc.ncep.noaa.gov/products/global_monitoring/precipitation/global_precip_accum.shtml

https://www.nwrfc.noaa.gov/water_supply/wy_summary/wy_summary.php?tab=5

Notes

Since 2016 a modest **market squid** (*Doryteuthis [Loligo] opalescens*) fishery has developed along the **Oregon** coast, with landings of 1,260, 3,196 and 2,378 metric tons (mt) during 2016, 2018 and 2019, respectively. During 2020 March and April catches totaled 3,289 mt. This inshore fishery using mainly seines and trawls on spawning squid takes place between 43.4°-44.5°N and landings are made into Newport, Charleston and Winchester Bay, OR. Smaller Oregon catches were made during warm periods in the 1980s and 1990s. In **California** the 2020-2021 squid season opened in April, with total landings of 3,491 mt taken north of Point Conception.
https://www.dfw.state.or.us/MRP/regulations/commercial_fishing/docs/MrktSquidPubMtg_2020_Final.pdf
https://www.dfw.state.or.us/news/2020/ https://wildlife.ca.gov/Conservation/Marine/Pelagic/Landings
https://www.seafoodnews.com/Story/1169147/Oregon-Sees-Record-Market-Squid-Landings
https://wildlife.ca.gov/Conservation/Marine/Pelagic/Landings
https://www.fisheries.noaa.gov/species/california-market-squid

During April an intense and relatively wide spread bloom of the dinoflagellate *Lingulodinium polyedra*, clearly evident in satellite imagery, increased off Southern California and northern Mexico. Unique coloration ("red tide") and odor are associated with this bloom of *L. polyedra*, a common dinoflagellate of Southern California phytoplankton communities. In late March, images from a robotic microscope stationed off San Diego County showed early stages of the spring phytoplankton bloom that included several phytoplankton species, including *L. polyedra*. By 27 April, measurements at Scripps Institution of Oceanography Pier (SIO) at La Jolla (32.9°N) showed the highest cell numbers of *L. polyedra* ever recorded at SIO with 9 x 10^6 cells per liter (9 times the previous maximum) and also 1,083 micrograms per liter (mg/m^3) chlorophyll, the highest chlorophyll concentrations observed since routine measurements began in 1983. Fish and invertebrate die-offs occurred as low dissolved oxygen events occurred with biological decomposition of bloom products. Red Tides of lesser magnitude are not unusual in Southern California, however the record high biomass led to very intense red/brown water color and to some unusually intense and prolonged bioluminescence displays. *L. polyedra* is not known to be a health issue for humans in California. https://sccoos.org/california-hab-bulletin/red-tide/
https://www.cdph.ca.gov/Programs/CEH/DRSEM/CDPH%20Document%20Library/EMB/Shellfish/Red%20Tide%20QandA.pdf
https://scripps.ucsd.edu/news/everything-you-wanted-know-about-red-tides , Redtide@cdph.ca.gov
http://cdphdata.maps.arcgis.com/apps/MapTools/index.html?appid=42a78fba680c4c43970cfc5dfe878d8d